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"Affordability in the Submarine Force"

**Banquet Address of
Under Secretary of Defense for Acquisition and Technology
Dr. Paul G. Kaminski
to the
Submarine Technology Symposium 1996
Johns Hopkins APL, Laurel MD**

May 16, 1996

I am really pleased to be with you this evening. I maybe have some advantages and disadvantages in discussing affordability in the submarine force in that I have not personally had a great deal of experience with the submarine community. I have had some experience with the airborne stealth community. Some of those experiences coincide with those of this community, some do not. We have an opportunity to share some of this experience base and talk about some common issues tonight.

From your perspective today and mine, I think this is a critically important time for submarines, both in the Department of the Navy and the Department of Defense, and I think also on the Hill. Unlike last year, and thanks to many of the people in the audience tonight, the Seawolf is no longer an issue for us. We are building the SSN-23 and then moving to a more affordable submarine path for the future. I think this year the issues no longer seem related to our general course ahead. They appear to be related with the particular milestones associated with that course—some of them concerned with what we are going to do through the next couple of years or so.

The path we are on begins with the New Attack Submarine. There is still some sense that this is where the consensus stops. Some have questioned the design of the New Attack Submarine. Is it capable enough? Have you included enough technological advances? On the other side of the coin, is it still too expensive? These are only a few of the questions being asked, but I think we are beginning to achieve consensus on these broad issues. In my own personal opinion, the New Attack Submarine—as presented in the fiscal year 1997 President's budget request—contains the right capabilities. I think the acquisition program is being wisely executed. I think the right technologies are being incorporated in the lead ship that we are planning to build at Electric Boat beginning in fiscal year 1998. Now I do have some issues that I do want to talk about a little later, about for example, whether we provided sufficient entry ramps for some of the technologies that need to find their way into the New Attack Submarine over the longer term.

Tonight I want to talk about at least three pre-requisites that I believe are necessary to sustain an affordable submarine force over the long term. The first of these is production of a submarine design that meets the mission requirements and has

sufficient provisions to incorporate growth over the life of the platform. The second is skillful execution of the acquisition program—thinking about the long run, where we are headed and how. And third, making prudent investments in the sustaining science and technology base.

The path ahead to an affordable submarine force begins with the right design for the New Attack Submarine. Right in the sense that the design is matched to the needs of the post cold-War era. In a budget constrained environment, we can not afford “design overkill” or to field capabilities which far exceed the real-world requirements. If I turn to the Seawolf for moment, I would reflect back and say this very capable weapon system was designed and built to counter the Soviet blue water submarine threat. It features a strengthened sail, designed to permit operations under the polar ice cap for taking the fight to the Soviets in their own front yard. It sports an eight-tube, double-deck torpedo room to simultaneously engage multiple threats. It incorporates the latest in quieting technology to keep pace with the threat then posed by an aggressive Soviet Union. I had the opportunity to walk through the Seawolf in Groton, Connecticut and it truly is an impressive system.

But now I think the mission is changing. As many in this audience are aware, there will be increasing emphasis on operations in the littorals. This means that the New Attack Submarine will be increasingly required to counter threats from mines, ASW patrol aircraft, “brown water” diesel submarines and bottom surveillance systems. In the littorals, there will be emphasis on missions like undetected insertion and extraction of special operations teams. All of this is in addition to superiority in its core competency of open-ocean operations. My bottom line here is that the real world requirements for the submarine force are evolving and more complex than in the past. The issue is not whether the requirements are greater or less, and consequently whether the design is more or less capable. The issue is that the requirements are different, and therefore, the capabilities of the design must be different.

Matching the design to the validated requirement is the first affordability prerequisite. For example, the New Attack Submarine may not need a Seawolf-style sail or a massive, double-deck torpedo room. However, it will need a level of quieting and an acquisition capability sufficient to counter the improving stealth technology such as that being demonstrated by the Russian submarine force. It will need a nine-man seal team lockout chamber and an advanced mine detection system. I am absolutely convinced that it will need to be integrated into the nation’s system-of-systems architecture for C4ISR—Command, Control, Communications, Computers, Surveillance and Reconnaissance.

I think at this point in the design process, the key architectural design trade issue here is one of creating a suitable open systems environment to provide a foundation for the incorporation of future sensor and processing capabilities—that is, to provide the

means to be upgradable in the future. I think trades need to be made to look at the issue of what are the right on-board storage capacities for taking the information that is needed to accomplish the mission in the same sense that I would describe—in Army terms—as intelligence preparation of the battlefield. Knowing the battlespace means knowing the information about potential targets and knowing the foundation of parameters and signatures that should stay constant. Careful attention needs to be given to the amount of processing done on- and off-board the submarine platform and to dealing with incorporation of information from various off-board sensors; some carried on manned aircraft, some carried on unmanned aircraft, some carried on ground vehicles, and some implanted in various environments within the battlespace.

It is my sense that our submarine programs could benefit from the experiences of another community. We are in a period where I would ask you to open up your horizons to think about submarine operations in another way. The novelist Graham Green once said that every now and then a time comes where a door opens and lets the future in. This is a time when I think it is appropriate to think about what is ahead for the submarine force. The paradigm of the past—run silent, run deep—probably is not the paradigm for the future. Mixing some of the principles of “run silent, run deep” with some of the principles of “surfing the net” is probably the right combination to think about for the future. We need to think about creating for our submarine force the same kind of picture that we are looking to put together today for other combat forces.

Probably the most mature piece of this future vision is reflected in what we have in a fused picture for the air battle. We have today deployed a system such as AWACS which provides the complete radar picture of everything that is in the air over about a 300 square kilometer area. We have this data fused with various off-board intelligence sensors that, in many situations, can tell us not only what is up in the air, but what is the capability of the various platforms and even in some cases, what is the intent of the particular airborne platform. Imagine that kind of a fused picture of the air war and how valuable that intelligence picture is.

We are in the process of putting that kind of picture together today for the ground battle. We have a system named Joint STARS, that has just come back from a deployment in Bosnia. That system has provided us with the first overall picture of the ground battle in an entire theater. We have not put a complete picture together yet with Joint STARS data fused with the intelligence from other off-board sensors. We have a moving target indication base, and the ability to use synthetic aperture radar both on-board and from off-board sensors like the Predator. We do not have the intelligence yet completely fused in this picture, but it is coming; it will be there within a couple of years.

The picture I would like you to think about is having that same fused picture of the battlespace that our submarines will be operating in as they carry out their assigned

missions. It would mean knowing what is in the littorals, what is in the battlespace when we are dropping off SEALs, what the whole threat picture is, and possessing the ability to truly have what Admiral Bill Owens would call "Dominant Battlefield Awareness." I think we are on the path to begin to do that, but it requires some new thinking, some new approaches.

One last concept I would layout has to do with taking aboard all of this sensor information. I would describe to you an initiative that I approved about three months ago to provide wide bandwidth intelligence mapping, weather and other information to our deployed forces in Bosnia. We for years have been limited in supplying intelligence using ninety-six kilobit-per-second links, something that takes 30 minutes to deliver a photograph. We decided to take advantage of commercial direct broadcast TV satellite technology. So in a period of three months, I have now seen this whole system put together and demonstrated in the Pentagon. It will be fielded in Bosnia within the next month.

The system is really very simple. It consists of a direct broadcast TV system—one transponder is leased on a commercial satellite that provides a 24 megabit-per-second link. All our forces need to receive that link is a 20-inch dish and decryption gear. All we have done to modify the system is add two features. One, we have moved the location of the beam, so that the beam resides over our forces. Two, we have implemented a different programming concept. Rather than the normal procedure of publishing weeks in advance what the programming will be on the spacecraft, we have given our field commanders a 5,000-mile remote control. They can control the programming either instantaneously or establish programming for a predefined time slot so that anyone in the field has access to weather information, to intelligence information, to the latest geospatial information or mapping information, and our commanders have the ability to teleconference.

Now, in a sense, this idea seems far afield from anything anyone would consider in supporting submarine operations. But think about the ability of a 20-inch dish, or if you are willing to have a little less than 24 megabits-per-second, you can close this link at a lower bandwidth with a smaller dish. The link does not have to be closed all the time. You have the opportunity to pre-program when that link will be closed. So there is a capability of using on-board information and using all the various off-board sensors that are available to us to provide a complete picture of the battlespace.

Turning now to the second pre-requisite for an affordable submarine force, the acquisition program must be wisely executed. Acquisition reform can not be just another theory. It must be practiced in the field. No where has it been more fully embraced than by the acquisition team working on the New Attack Submarine. I have dealt with that team first hand. Just two weeks ago, I had the privilege of attending an awards ceremony where Secretary of Defense Bill Perry presented the David Packard

Award for Acquisition Excellence to the New Attack Submarine C3I program team. It was very interesting that it was presented to the C3I program team in light of what I just said about the door opening for those capabilities in the future. This award recognizes the team's many management and technological innovations, including the use of a single design agent, commercial off the shelf electronics, and a technology refreshment process to provide upgrades for the future. It follows on the heels of the "Best of Open Systems Solutions" Award presented early in fiscal year 1995 by the Federation of Government Information Processing Councils for the New Attack Submarine's C3I open systems architecture. We have a design foundation for building the C3I architecture needed to provide the situational awareness—dominant battlespace awareness—into the capability of our New Attack Submarine.

I think this program is a shining example of applying lessons learned and acquisition reforms from other successful government and industry programs. The program's use of Integrated Product and Process Development (IPPD) brings the combined experience of the shipbuilder, major vendors, the Navy Program Office, and submarine operators and maintenance personnel to bear on the ship design. For example, the early involvement of trades personnel is ensuring the design is optimized to shipbuilder construction processes and facilities. This design/build approach will allow a smoother transition from design to manufacturing, and reduce the number of changes typically encountered during lead ship construction. Manufacturing personnel have been involved in the design process here—just as they were in the Boeing 777 design—using a very similar set of computer-based design tools. As a result, when compared to prior programs, the New Attack submarine has 36 percent fewer design documents, 1000 fewer pages of specifications, and fewer unique parts—about 10,500 versus 98,000 for the Seawolf design.

The New Attack Submarine design team is a strong proponent of the use of Commercial-Off-the-Shelf equipment, or COTS. For example, in the area of hull, mechanical, and electrical, the submarine will use a revolutionary Advanced Ship Control System. This system radically changes the method of controlling the ship's underwater flight. Advanced flat panel displays will be arrayed in front of two operators—compared to four in the past. They will control the submarine using a "fly-by-wire" method. Software-driven electronic signals will replace the traditional electro-mechanical devices used in the past.

This leads me to a third pre-requisite for an affordable submarine force. There must be a commitment to make prudent investments in the undersea warfare science and technology base. In the short term, there is a need to insert mature technologies to provide advanced capabilities at lower cost. However, like a fine wine, no technology should be inserted before it's time. I have seen too many cases where a major program comes to a grinding halt, waiting for the "bugs" to be worked out of an immature technology. Over the long term, a technology insertion plan is needed to guide

investments and sustain a critical level of expertise in the technology associated with this design base.

Some have questioned whether the Department has inserted enough technology into the New Attack Submarines. I believe the Navy and the Department have taken a prudent course with respect to the New Attack Submarine – we have picked all the “low hanging fruit;” that is, the mature technologies that are available for insertion into the lead ship. Furthermore, we have prioritized a list of emerging technology areas that have potential for insertion in the future. That listing appears in a Secretary of Defense report on Nuclear Attack Submarine Procurement and Submarine Technology. It was submitted to the Congress in March of this year. Certainly the source of that technology listing is derived from the Navy commissioned panel of experts led by Vice Admiral Al Baciocco. They reviewed the technologies on the horizon to see what technologies could be realistically developed to support the timeline for the New Attack Submarine. They reached the same conclusion that we did, that the New Attack Submarine design incorporates the latest and best technology available at this time and in the near future.

Some of the New Attack Submarine technology initiatives are evolutionary – others are truly revolutionary. For example, DARPA’s machinery cradle program has the potential to significantly improve both affordability and performance by using a particularly unique truss structure. Such a structure supports the expanded use of commercial grade components to enhance affordability without compromising operational performance. This is a truss structure that has been optimized for individual machines and achieves significant vibration and shock control through some very innovative techniques in structural damping. Further, by the use of innovative passive and/or active hull attachments, the submarine acoustic signature can be significantly reduced even when using conventional pressure hull designs. When coupled to a greater understanding of submarine propulsors, the machinery cradle concept can be expanded to address the full submarine design space. Early tests of DARPA’s cradle concept are very encouraging and the concept is being pursued by the Navy at the Office of Naval Research and within the Naval Sea Systems Command. Over the years, DARPA’s Submarine Technology Program has produced revolutionary new technology. My view is that DARPA’s role in submarine technology needs to remain focused on leveraging revolutionary – but not evolutionary – technologies.

While DARPA’s cradle concept is being pursued, a unique Modular Isolated Deck Structure, or MIDS, enables the use of low cost COTS equipment for the New Attack Submarine’s C3I system. Ship modules are constructed and tested off hull. When placed in the ship, they rest on mounts individually capable of carrying 50,000 pounds. This MIDS technology allows the decks to absorb sound, but more importantly to absorb shock. This allows lower cost commercial electronic equipment to perform effectively in a shipboard environment. I think MIDS is the critical enabling technology

which allows the New Attack Submarine to have Seawolf-level acoustic stealth in a smaller hull. With MIDS, the New Attack Submarine will be about five times quieter than a 688-class submarine.

To fully leverage commercial electronics in the C3I system, an innovative "technology refresh" approach has also been factored into the acquisition. The C3I system utilizes an open system architecture design that allows commercial components to be easily interchanged with existing components. With the technology refresh strategy, the C3I prime contractor can update the hardware and software of the system to the current technology baseline. I think this is critically important because some of the technology is turning over about every 18 months or so; especially that associated with advanced processing capabilities. This occurs prior to the completion of the ship's Post Shakedown Availability, or PSA milestone. From the time of system delivery to the ship to the Navy's acceptance after completion of PSA, the C3I prime contractor retains responsibility for the system.

At this point, I would like to acknowledge that the New Attack Submarine is not the only program in which the Submarine Force is leveraging the latest technology. This is important because in 20 years about 60 percent of the force will be 688 class submarines. So we have to look at a way to insert technology to keep the 688-class viable for the future. The Navy recently conducted an exhaustive study of the current state of submarine acoustic margin of superiority. Dissatisfied with the current margin and the trend, the Navy concluded that existing computer processing capability could be tapped to improve the acoustic superiority of existing submarine platforms. The Navy has undertaken an acoustic rapid COTS insertion program to bring current commercial technology to bear on a submarine's acoustic signal processing capability. I would point out that there is great potential for improvement here in that we can forecast very clearly about a 1,000-fold increase in our processing capability over the next decade or so. We have thus far, since the introduction of the microprocessor, experienced about a 10,000-fold improvement, but there is still easily a 1,000-fold improvement to go and to be exploited. One of the key elements of the Rapid COTS Insertion program grew out of a 1991 Small Business Innovation Research (SBIR) Program--the Multi-Purpose Processor. One Multi-Purpose Processor has more processing capability than all the 688I Class submarine BSY-1 Combat Control Systems in the fleet. The next step in this evolution is to migrate to general purpose processors, such as personal computers. In this way, the Navy is considering and must consider technology refreshment over the life cycle of these platforms.

Earlier I mentioned the need to integrate submarines in the nation's larger system-of-systems C4ISR architecture. Next month, the USS CHICAGO is scheduled to take control of the Predator Unmanned Aerial Vehicle in a demonstration with Navy SEALs off San Clemente Island, California. This effort is a significant first: this will be the first example of the Predator being controlled from a Navy ship. The submarine

will be configured with a super high frequency antenna, similar to that used for direct broadcast TV, except adapted for seagoing conditions unique to submarines. A SUN SPARC workstation will be used for directional control of the antenna. The scenario includes a requirement to redirect a land-based Predator to identify an emergent littoral target, such as a SCUD missile launcher. The Predator will be directed to conduct target surveillance in order to plan a real-time SEAL insertion. While the team is conducting its ingress and egress, the orbiting Predator can monitor for hostile force interference the mission and provide that information back in real time. This example really highlights the fact that Advanced Concept Technology Demonstrations, like the Predator, are an effective, inexpensive means to evaluate the operational utility of mature technologies, and to determine if this is a concept we ought to apply more often.

Historically, submarine technology development, maturation, and transition have been performed on a cyclical basis. The cycle began as a preface to new submarine design. Funding for technology development was increased dramatically to provide technologies for inclusion in the new class design, only to be scaled back to subsistence levels during serial submarine production. Over time this approach was successful, mostly because there was continuity or overlap of multiple submarine class designs or design upgrades. In today's environment, the submarine technology transition process must change from one that is cyclical in nature, to a more active, but steady approach. To help keep the various Defense-wide submarine technology research and development efforts on track, John Douglass, the Assistant Secretary of the Navy, and I will co-chair a Submarine Technology Oversight Council, that includes the Department's leading technologists and submarine acquisition officials, and the major submarine contractors—Electric Boat, Newport News Shipbuilding, and Lockheed Martin. In fact, our first meeting will be this coming Monday. In the ensuing months, the Council will take a closer look the Department's submarine science and technology process to ensure that key technologies are identified, matured and transitioned to the submarine force in a timely way.

In summary, I have shared with you three necessary conditions for sustaining an affordable submarine force—production of a submarine design that meets the mission needs, yet provides a foundation for growth into the future; the skillful execution of the acquisition program; and prudent investment in the underlying science and technology base. It is my sense that the Department and the Navy are on the right path in all three areas. The New Attack Submarine is the right design for today's evolving and more complex threat environment. The acquisition program is being wisely executed and planned investments in submarine science and technology are enabling continued improvements in capability if we can simply reach out and create entry ramps for them to find their way into the program. I believe submarines are a vital part of this nation's defenses. Thanks to many of you in the audience, our U.S. submarine force today is second to none. You can be assured of the top-down commitment from the Secretary of

Defense, from myself, from Assistant Secretary Douglass and the whole top leadership in the Department that we will keep it that way in the future.

Thank you all.